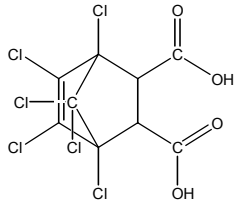
CHLORENDIC ACID
CAS No. 115-28-6
First Listed in the *Fifth Annual Report on Carcinogens*



CARCINOGENICITY

Chlorendic acid is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity in experimental animals (NTP 304, 1986). When administered in the diet, the compound was carcinogenic in male mice and in rats of both sexes. In male rats, chlorendic acid caused neoplastic nodules of the liver and acinar cell adenomas of the pancreas. Increased incidences of alveolar/bronchiolar adenomas and preputial gland carcinomas may also have been related to the administration of chlorendic acid. In female rats, the compound induced neoplastic nodules and carcinomas of the liver. The compound caused increased incidences of hepatocellular adenomas and carcinomas in male mice, but there was no evidence of carcinogenicity of chlorendic acid in female mice.

There are no data available to evaluate the carcinogenicity of chlorendic acid in humans.

PROPERTIES

Chlorendic acid is a fine, white, nondusting crystal that is slightly soluble in water and nonpolar organic solvents such as benzene, carbon tetrachloride, and *n*-hexane. It is readily soluble in more polar organic solvents such as methanol, ethanol, and acetone. Chlorendic acid loses water when heated in an open system, and at temperatures above 200 ^{o}C, the chemical tends to discolor and forms an anhydride that melts at 230-235 ^{o}C. When heated to decomposition, it emits toxic fumes of hydrochloric acid and other chlorinated compounds.

USE

Chlorendic acid is used primarily as a reactive flame-retardant monomer in polyester resins and coatings, epoxy resins, and polyurethane foams (reactive flame retardants have functional groups which bond covalently to the polymer material which they protect) (SRIb, 1984). It is also used as a chemical intermediate in the manufacture of corrosion-resistant polyester resins, in the production of polymer systems used in oil-modified paints and coatings, as a hardening agent for epoxy resins used in printed circuit boards, and in the production of dibutyl chlorendate and dimethyl chlorendate (USEPA, 1983; SRI, 1982). Dibutyl and dimethyl chlorendate are flame-retardant additives. Chlorendic acid is also used as an extreme pressure lubricant (SRI, 1982).

PRODUCTION

No current data are available on the production of chlorendic acid in the United States. Currently, the compound is manufactured in Belgium (IARC V.48, 1990). Two U.S. suppliers and one U.S. producer are listed for chlorendic anhydride (Tilton, 1997; SRIa, 1997; IARC V.48, 1990). Combined production of the acid and the anhydride totaled over 4.41 million lb in 1987 but has been declining since the early 1980s (IARC V.48, 1990). In 1981, U.S. production of chlorendic acid was estimated to be 7 million lb and imports to be approximately 140,000 lb (NTP 304, 1986; USEPA, 1983). The USITC reported one major importer, but did not report an import figure or production data on chlorendic acid from 1979 to 1981 (USEPA, 1983). The 1979 TSCA Inventory listed one manufacturer/importer of chlorendic acid in 1977 (TSCA, 1979). The manufacturer/importer reported zero production, but the TSCA Inventory estimated that 3 million to 30 million lb of chlorendic acid were produced or imported in 1977. Over 1,000 lb of the compound were produced in the United States in 1975 (SRIa, 1984). No data on chlorendic acid exports were available.

EXPOSURE

The primary route of potential human exposure to chlorendic acid is dermal contact, while some small exposure may possibly occur through inhalation. It is manufactured in an essentially closed system which would seem to minimize, although not eliminate, potential occupational exposure during the manufacturing process (NTP 304, 1986). When used as a reactive flame-retardant or hardening agent, chlorendic acid bonds covalently to the polymer, resulting in less potential for human exposure. In its uses as an extreme pressure lubricant and a chemical intermediate, there is the possibility of human exposure to chlorendic acid. Chlorendic acid was not listed in the National Occupational Exposure Survey, conducted by NIOSH from 1981 to 1983. However, it was included in the National Occupational Hazard Survey (NOHS), conducted by NIOSH from 1972 to 1974. The NOHS estimated that 166 workers were potentially exposed to chlorendic acid in the workplace (NIOSH, 1976). This estimate was derived only from observations of the use of tradename products known to contain the compound.

The Toxic Chemical Release Inventory (EPA) estimated that in 1996 a total of 43 lb of chlorendic acid was released to the environment from only one facility that produced, processed, or used the chemical in the United States. This facility, located in Philadelphia, Pennsylvania, was reporting under the industrial classification for the manufacture of plastics materials and resins (SIC Code 2821) (TRI96, 1998).

REGULATIONS

EPA regulates chlorendic acid under the Toxic Substances Control Act (TSCA), requiring reporting of production, use, and exposure data, and sets forth requirements for the submission of information relating to the release of chlorendic acid and requires the submission of lists and copies of health and safety studies on chlorendic acid and mixtures containing chlorendic acid. OSHA regulates chlorendic acid under the Hazard Communication Standard and as a chemical hazard in laboratories. Regulations are summarized in Volume II, Table B-19.